

Vector Notes 4th Block 8.18.11

Solve for:	Equation:
V_f	$X_f = X_i + V_i t + \frac{1}{2} a t^2$
t , if $v_i = 0$	$X_f = X_i + V_i t + \frac{1}{2} a t^2$
V_f	$a = \frac{V_f - V_i}{t}$
V	$K = \frac{1}{2} m v^2$
L	$T = 2\pi \sqrt{\frac{L}{g}}$
r	$F = \frac{G m_1 m_2}{r^2}$

$$X_f = X_i + V_i t + \frac{1}{2} a t^2$$

$$V_i t = X_f - X_i - \frac{1}{2} a t^2$$

$$V_i = \frac{1}{t} (X_f - X_i - \frac{1}{2} a t^2)$$

$$X_f = X_i + V_i t + \frac{1}{2} a t^2$$

$$X_f = X_i + \frac{1}{2} a t^2$$

$$\frac{1}{2} a t^2 = X_f - X_i$$

$$t^2 = \frac{2}{a} (X_f - X_i)$$

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$$a = \frac{V_f - V_i}{t}$$

$$V_f - V_i = a t$$

$$V = V_i + a t$$

$$K = \frac{1}{2} m v^2$$

$$\sqrt{V^2} = \sqrt{\frac{2K}{m}}$$

$$V = \sqrt{\frac{2K}{m}}$$

$$T = 2\pi \sqrt{\frac{L}{g}}$$

$$\left(\sqrt{\frac{L}{g}}\right) \left(\frac{1}{2\pi}\right)^2$$

$$\frac{L}{g} = \frac{T^2}{4\pi^2}$$

$$L = \frac{T^2 g}{4\pi^2}$$

$$F = \frac{G m_1 m_2}{r^2}$$

$$\sqrt{r^2} = \sqrt{\frac{G m_1 m_2}{F}}$$

$$r = \sqrt{\frac{G m_1 m_2}{F}}$$

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VECTORS:

Vectors	Scalars
- two parts	- one part
magnitude (number)	magnitude
direction	direction
(+/- or angle and compass direction)	

Examples:

Velocity	speed
force	energy
displacement	mass
acceleration	time
Momentum	distance
	Volume
	area
	perimeter

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SOHCAHTOA

$\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{a}{c}$
 $\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{b}{c}$
 $\tan \theta = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{a}{b}$

Adding Vectors

- Graphically

$\vec{a} + \vec{b} \Rightarrow \vec{c}$

Algebraically:

$\vec{a} = 15 \text{ m at } 35^\circ \text{ North of East}$
 $\vec{b} = 20 \text{ m at } 30^\circ \text{ North of East}$

$\vec{a} + \vec{b} = \vec{c}$

$a_x + b_x = c_x$
 $15 \cos 35^\circ + 20 \cos 30^\circ = c_x$
 $12.3 \text{ m} + 17.3 \text{ m} = c_x$
 $c_x = 29.6 \text{ m}$

$a_y + b_y = c_y$
 $15 \sin 35^\circ + 20 \sin 30^\circ = c_y$
 $8.6 \text{ m} + 10 \text{ m} = c_y$
 $c_y = 18.6 \text{ m}$

$c = \sqrt{c_x^2 + c_y^2} = 33.5 \text{ m}$
 $\theta = \tan^{-1} \left(\frac{c_y}{c_x} \right) = 33^\circ$

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$\vec{a} = 8 \text{ m at } 64^\circ$
 $\vec{b} = 10 \text{ m at } 28^\circ$

$a_x + b_x = c_x$
 $(8 \text{ m}) \cos(64^\circ) - (10 \text{ m}) \cos(28^\circ) = c_x$
 $3.5 \text{ m} - 8.8 \text{ m} = c_x$
 $c_x = -5.3 \text{ m}$

$a_y + b_y = c_y$
 $(8 \text{ m}) \sin(64^\circ) + (10 \text{ m}) \sin(28^\circ) = c_y$
 $7.2 \text{ m} + 4.7 \text{ m} = c_y$
 $c_y = 11.9 \text{ m}$

$c = \sqrt{c_x^2 + c_y^2} = 13 \text{ m}$
 $\theta = \tan^{-1} \left(\frac{c_y}{c_x} \right) = 66^\circ$

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